

## Permit Fact Sheet

### General Information

Permit Number	WI-0023566-09-0
Permittee Name and Address	Village of Casco 311 Church Ave, Casco, WI 54205
Permitted Facility Name and Address	Casco Wastewater Treatment Facility 406 1st Street, Casco, Wisconsin
Permit Term	April 01, 2026 to March 31, 2031
Discharge Location	406 1st Street, Casco, Wisconsin SW ¼, NW ¼, NW ¼ of Section 17, Township 24 North, Range 24 East, Village of Casco, Kewaunee County, WI
Receiving Water	Casco Creek in Kewaunee River Watershed of Northeast Lakeshore Basin in Kewaunee County
Stream Flow (Q <sub>7,10</sub> )	0.32 cfs
Stream Classification	Cold Water (Class II) aquatic life community, recreation, and nonpublic water supply At Rockledge Rd, approximately one mile downstream of the discharge, Casco Creek is classified as a Class I trout water and an Exceptional Resource Water (ERW).
Discharge Type	Existing Continuous Discharge
Annual Average Design Flow (MGD)	0.101
Industrial or Commercial Contributors	None
Plant Classification	A1 - Suspended Growth Processes; B - Solids Separation; C - Biological Solids/Sludges; P - Total Phosphorus; D - Disinfection; L - Laboratory; SS - Sanitary Sewage Collection System
Approved Pretreatment Program?	Not applicable

### Facility Description

The Village of Casco owns and operates the Casco Wastewater Treatment Facility that treats residential and commercial domestic wastewater from the Village sanitary sewer collection system. Class B sludge generated from the treatment facility is either land applied on department approved sites or hauled to another permitted facility. The paragraphs below describe the liquid and solids treatment train of the Casco Wastewater Treatment Facility.

**Liquid Treatment Train:** The facility provides preliminary treatment, secondary treatment, tertiary treatment, and seasonal disinfection to the influent from the Village of Casco. Preliminary treatment consists of fine screening and influent pumping. Secondary treatment processes include activated sludge treatment with aeration basins, chemical phosphorus removal with ferric chloride, and secondary clarification. The tertiary treatment process includes two sand

filters. Lastly, the effluent is treated with seasonal disinfection with an ultraviolet (UV) disinfection system. The final treated effluent then flows by gravity through to the outfall structure to the Casco Creek via Outfall 001.

**Solids Treatment Train:** The solids treatment includes aerobic digestion and storage. All the generated waste activated sludge from the final clarifier is sent to the aerobic digester tank. The aerobically digested liquid sludge can be hauled by truck to be land applied on department approved sites via Outfall 002 as Class B liquid sludge or hauled to another permitted facility.

## **Substantial Compliance Determination**

After a desk top review of all discharge monitoring reports, compliance maintenance reports, land application reports, compliance schedule items, and a site visit on August 20, 2024, this facility has been found to be in substantial compliance with their current permit.

Compliance determination made by Trevor Moen, Wastewater Engineer, on January 9, 2026.

## **Fact Sheet Organization**

This fact sheet explains the rationale and assumptions used in deriving the conditions and requirements set forth in this permit. Additionally, this fact sheet highlights changes in permit conditions that the department proposes to make when reissuing the WPDES permit. This fact sheet compares conditions in the previous permit to those in the reissued permit. The previous permit remains in effect until the permit is reissued. The tables that follow were taken from the permit and are numbered in this fact sheet as they are numbered in the permit. Highlighted text and cells within tables indicate permit conditions that are new or different from those found in the previous permit.

## Sample Point Descriptions

Sample Point Designation		
Sample Point Number	Discharge Flow, Units, and Averaging Period	Sample Point Location, Waste Type/Sample Contents and Treatment Description (as applicable)
701	Not applicable – Influent flow rate was not required to be reported during the previous permit term.	INFLUENT: At Sampling Point 701, the permittee shall collect representative samples of the influent from the influent automatic sampler drawing 24-hour flow proportional composite samples from the channel after the mechanical screen. Starting on April 1, 2029, the permittee shall measure the influent flow rate using a continuous flow recording device at a representative location prior to the aeration tanks.
001	Daily Average: 0.0748 MGD (October 2019 to November 2025)	EFFLUENT: At Sampling Point 001, the permittee shall collect representative samples of the final effluent from the effluent automatic composite sampler drawing 24-hour flow proportional composite samples from the channel after the tertiary filters, except the permittee shall collect grab samples of the effluent for pH, dissolved oxygen, and E. coli following the Ultraviolet (UV) disinfection system prior to being discharged to the Casco Creek via Outfall 001. The permittee shall measure the effluent flow rate using a continuous flow recording device after the tertiary filters and prior to the UV disinfection system.
002	Average Annual Sludge Generated: 47,000 gallons (2019 to 2024)  Average Annual Sludge Land Applied: 5.7 metric tons (2019 to 2024)	LIQUID SLUDGE: Aerobically digested liquid sludge. At Sampling Point 002, the permittee shall collect representative grab and/or composite samples of the liquid sludge from the aerobic digester and after mixing annually for metals (List 1) and PFAS regardless if the liquid sludge will be land applied or not each year. Additionally, the permittee shall monitor annually for nutrients (List 2), Class B pathogen control requirements (List 3), and vector attraction reduction (List 4) if the liquid sludge will be land applied to department approved sites via Outfall 002 in any year.

# 1 Influent – Monitoring Requirements

## 1.1 Sample Point Number: 701- INFLUENT

Monitoring Requirements and Limitations					
Parameter	Limit Type	Limit and Units	Sample Frequency	Sample Type	Notes
Flow Rate		MGD	Daily	Continuous	The Flow Rate sample type shall be reported as “Continuous” starting on April 1, 2029. See also the Install Continuous Flow Recording Device Schedule.
BOD <sub>5</sub> , Total		mg/L	3/Week	24-Hr Flow Prop Comp	
Suspended Solids, Total		mg/L	3/Week	24-Hr Flow Prop Comp	

### Changes from Previous Permit:

- Addition of influent flow rate monitoring and reporting beginning on April 1, 2029.

### Explanation of Limits and Monitoring Requirements

**Flow Rate, BOD<sub>5</sub>, and TSS:** Monitoring of influent flow, BOD<sub>5</sub>, and TSS is required by s. NR 210.04(2), Wis. Adm. Code, to assess wastewater strengths and volumes and to demonstrate the percent removal requirements in s. NR 210.05, Wis. Adm. Code, and in the Standard Requirements section of the permit. Influent monitoring for BOD<sub>5</sub> and TSS remains unchanged from the previous permit.

**Sampling Frequency:** The department shall determine on a case-by-case basis the monitoring frequency to be required for each parameter in a permit pursuant to s. NR 205.066, Wis. Adm. Code. The Monitoring Frequencies for Individual Wastewater Permits guidance (April 12, 2021) recommends that standard monitoring frequencies be included in individual WPDES permits based on the size and type of the facility, in order to characterize influent quality and variability, to detect events of noncompliance, and to ensure fairness and consistency in permits issued across the state. Guidance and requirements in administrative code were considered when determining the appropriate monitoring frequencies for pollutants that have final effluent limits in effect during this permit term. Previously permitted monitoring frequencies for BOD<sub>5</sub> and TSS are consistent with the standard monitoring frequency outlined in guidance. The sampling frequencies for BOD<sub>5</sub> and TSS remain unchanged from the previous permit. This guidance states for influent flow rate the standard sampling frequency must be daily.

**Sample Type:** The department shall require the use of 24-hour flow proportional samplers for monitoring influent wastewater quality except where the department determines through the permit issuance process that other sample types may adequately characterize the influent quality pursuant to s. NR 210.04(4), Wis. Adm. Code. The 24-hour flow proportional sampling is the most representative method of collecting wastewater samples for wastewater coming into and being discharged from a wastewater treatment plant on a continuous basis. The sample type for BOD<sub>5</sub> and TSS remains unchanged from the previous permit.

For municipal waste at a treatment facility, methods of flow measurement shall include a continuous recording device pursuant to s. NR 218.05(1), Wis. Adm. Code.

## 2 Surface Water - Monitoring and Limitations

### 2.1 Sample Point Number: 001- EFFLUENT

Monitoring Requirements and Limitations					
Parameter	Limit Type	Limit and Units	Sample Frequency	Sample Type	Notes
Flow Rate		MGD	Daily	Continuous	
BOD <sub>5</sub> , Total	Weekly Avg	10 mg/L	3/Week	24-Hr Flow Prop Comp	
BOD <sub>5</sub> , Total	Monthly Avg	10 mg/L	3/Week	24-Hr Flow Prop Comp	
Suspended Solids, Total	Weekly Avg	10 mg/L	3/Week	24-Hr Flow Prop Comp	
Suspended Solids, Total	Monthly Avg	10 mg/L	3/Week	24-Hr Flow Prop Comp	
Suspended Solids, Total	Weekly Avg	37 lbs/day	3/Week	Calculated	See the TMDL Limitations section in the permit.
Suspended Solids, Total	Monthly Avg	26 lbs/day	3/Week	Calculated	See the TMDL Limitations section in the permit.
Suspended Solids, Total		lbs/month	Monthly	Calculated	See the TMDL Limitations section in the permit. Calculate and report the total monthly mass of TSS discharged in lbs/month on the last day of the month on the eDMR.
Suspended Solids, Total		lbs/yr	Monthly	Calculated	See the TMDL Limitations section in the permit. Calculate and report the 12-month rolling sum of the total monthly mass of TSS on the last day of the month on the eDMR.
pH Field	Daily Min	6.0 su	Daily	Grab	
pH Field	Daily Max	9.0 su	Daily	Grab	
Dissolved Oxygen	Daily Min	7.0 mg/L	Daily	Grab	
E. coli	Geometric Mean - Monthly	126 #/100 ml	Weekly	Grab	Monitoring and Limit applies May through September each year.

<b>Monitoring Requirements and Limitations</b>					
<b>Parameter</b>	<b>Limit Type</b>	<b>Limit and Units</b>	<b>Sample Frequency</b>	<b>Sample Type</b>	<b>Notes</b>
E. coli	% Exceedance	10 Percent	Monthly	Calculated	Monitoring and Limit applies May through September each year. See the E. coli Percent Limit section in the permit. Enter the result in the DMR on the last day of the month.
Nitrogen, Ammonia Variable Limit		mg/L	3/Week	24-Hr Flow Prop Comp	See the Daily Maximum Ammonia Nitrogen Limits section in the permit.
Nitrogen, Ammonia (NH3-N) Total	Daily Max - Variable	mg/L	3/Week	24-Hr Flow Prop Comp	See the Daily Maximum Ammonia Nitrogen Limits section in the permit.
Nitrogen, Ammonia (NH3-N) Total	Weekly Avg	9.3 mg/L	3/Week	24-Hr Flow Prop Comp	Limit applies June through October each year
Nitrogen, Ammonia (NH3-N) Total	Weekly Avg	9.5 mg/L	3/Week	24-Hr Flow Prop Comp	Limit applies November through March each year
Nitrogen, Ammonia (NH3-N) Total	Weekly Avg	6.6 mg/L	3/Week	24-Hr Flow Prop Comp	Limit applies April through May each year
Nitrogen, Ammonia (NH3-N) Total	Monthly Avg	5.6 mg/L	3/Week	24-Hr Flow Prop Comp	Limit applies June through October each year
Nitrogen, Ammonia (NH3-N) Total	Monthly Avg	4.7 mg/L	3/Week	24-Hr Flow Prop Comp	Limit applies November through March each year
Nitrogen, Ammonia (NH3-N) Total	Monthly Avg	3.4 mg/L	3/Week	24-Hr Flow Prop Comp	Limit applies April through May each year
Temperature Maximum		deg F	Weekly	Measure	Monitoring only from January 1, 2029 to December 31, 2029. See the Effluent Temperature Monitoring section in the permit.
Phosphorus, Total	Monthly Avg	1.0 mg/L	3/Week	24-Hr Flow Prop Comp	
Phosphorus, Total	Monthly Avg	2.2 lbs/day	3/Week	Calculated	See the TMDL Limitations section in the permit.

<b>Monitoring Requirements and Limitations</b>					
<b>Parameter</b>	<b>Limit Type</b>	<b>Limit and Units</b>	<b>Sample Frequency</b>	<b>Sample Type</b>	<b>Notes</b>
Phosphorus, Total		lbs/month	Monthly	Calculated	See the TMDL Limitations section in the permit. Calculate and report the total monthly mass of TP discharged in lbs/month on the last day of the month on the eDMR.
Phosphorus, Total		lbs/yr	Monthly	Calculated	See the TMDL Limitations section in the permit. Calculate and report the 12-month rolling sum of the total monthly mass of TP on the last day of the month on the eDMR.
Chloride		mg/L	Monthly	24-Hr Flow Prop Comp	Monitoring only from January 1, 2029 to December 31, 2029.
Nitrogen, Total Kjeldahl		mg/L	See Listed Qtr(s)	24-Hr Flow Prop Comp	See Nitrogen Series Monitoring section in the permit.
Nitrogen, Nitrite + Nitrate Total		mg/L	See Listed Qtr(s)	24-Hr Flow Prop Comp	See Nitrogen Series Monitoring section in the permit.
Nitrogen, Total		mg/L	See Listed Qtr(s)	Calculated	See Nitrogen Series Monitoring section in the permit. Total Nitrogen = Total Kjeldahl Nitrogen (mg/L) + Total (Nitrite + Nitrate) Nitrogen (mg/L).
Chronic WET		TUc	See Listed Qtr(s)	24-Hr Flow Prop Comp	See the Whole Effluent Toxicity Testing section in the permit.

### **Changes from Previous Permit**

- TMDL derived TSS mass effluent limitations and monitoring have been added to the permit.
- The sample frequency for pH and DO has been changed from “5/Week” to “Daily”.
- Fecal coliform monitoring and limits have been replaced with Escherichia coli (E. coli) monitoring and limits.
- TMDL derived total phosphorus mass effluent limitations and monitoring have been added to the permit.
- Nitrogen series monitoring has been added to the permit.
- Chronic WET testing has been added to the permit.

## Explanation of Limits and Monitoring Requirements

More information and explanation about the proposed water quality-based effluent limits (WQBELs) is found in the “Water Quality-Based Effluent Limitations for Casco Wastewater Treatment Facility (WI-0023566-09)” memo dated March 28, 2025.

**Flow Rate Monitoring:** For municipal waste at a treatment facility, methods of flow measurement shall include a continuous recording device pursuant to s. NR 218.05(1), Wis. Adm. Code. Effluent monitoring for flow remains unchanged from the previous permit.

**BOD<sub>5</sub>, TSS, pH, and DO:** Publicly owned treatment works with a discharge to a surface water classified as fish and aquatic life water shall meet the secondary treatment effluent limits specified for BOD<sub>5</sub>, TSS, pH, and DO in s. NR 210.05(1), Wis. Adm. Code, excluding the TSS mass limits. The permittee discharges to Casco Creek which is classified as a fish and aquatic life water. Therefore, effluent limitations in s. NR 210.05(1), Wis. Adm. Code apply. However, the department determined WQBELs for BOD<sub>5</sub>, TSS, and DO that are more restrictive.

The department calculated monthly BOD<sub>5</sub> limits based on the 26-pound method. The DO daily minimum limit of 7.0 mg/L must be included in the permit to ensure the DO in the receiving water does not decrease below the standard of 6.0 mg/L. The TSS concentration limits were then set equal to the BOD concentration limits based on best professional judgement in previous permits. Limitations for pH are contained in s. NR 210.05(1)(c), Wis. Adm. Code, which are equivalent to water quality standards in s. NR 102.04(3)(c), Wis. Adm. Code. The limits for BOD<sub>5</sub>, TSS, pH, and DO remain unchanged from the previous permit.

**TMDL derived TSS Mass Effluent Limitations:** If the department determines a limitation is necessary, the effluent limitation shall be consistent with a total maximum daily load (TMDL) if a TMDL has been approved by the U.S. Environmental Protection Agency (USEPA) for the receiving waterbody consistent with s. NR 205.067(3)(a), Wis. Adm. Code. The discharge to the Casco Creek is within the Northeast Lakeshore Basin TMDL area. The Northeast Lakeshore Basin TMDL for total phosphorus and total suspended solids was approved by the USEPA on October 30, 2023. The department has determined that TSS effluent limitations are necessary. Therefore, the department must calculate TMDL derived TSS limits to be consistent with the Northeast Lakeshore Basin TMDL. The approved total suspended solids waste load allocation (WLA) for the permittee is 6,547 lbs/year which results in calculated total suspended solids mass limits of 37 lbs/day as a weekly average and 26 lbs/day as a monthly average. Since the TSS WLA is expressed as an annual load (lbs/yr), the permittee must also calculate and report the rolling 12-month sums of total monthly loads for TSS. Rolling 12-month sums can be compared directly to the annual wasteload allocation. Based on the effluent TSS data submitted on eDMRs from January 2020 to January 2025, the permittee can currently meet the TSS mass limits, and a compliance schedule is not needed.

**E. coli:** Revisions to bacteria surface water quality criteria to protect recreational uses and accompanying E. coli WPDES permit implementation procedures became effective May 1, 2020. The new rule requires that WPDES permits for facilities with required disinfection include monitoring for E. coli while facilities are disinfecting during the recreation period and establish effluent limitations for E. coli established in s. NR 210.06(2), Wis. Adm. Code. The administrative code rule changes included the following actions: revised the bacteria water quality criteria from fecal coliform to E. coli to protect recreation in ch. NR 102, Wis. Adm. Code; removed fecal coliform criteria for certain individual waters from ch. NR 104, Wis. Adm. Code; revised permit requirements for publicly owned sewage treatment works in ch. NR 210, Wis. Adm. Code; and updated approved analytical methods for bacteria in ch. NR 219, Wis. Adm. Code.

The permittee discharges to the Casco Creek and the permittee must ensure the receiving water is suitable for supporting recreational use and protect humans from illness caused by fecal contamination due to recreational contact with surface water. The Casco Creek is not classified as a public water supply with regard to disinfection. Therefore, the permittee is only required to disinfect during the recreation season pursuant to s. NR 210.06(1)(a), Wis. Adm. Code. Section NR 210.06(2)(a)1., Wis. Adm. Code, includes two limits which must be included in permits for facilities which are required to disinfect in order to protect the recreation season (May to September): The geometric mean of E. coli bacteria in effluent samples collected in any calendar month cannot exceed 126 counts/100 mL. No more than 10% of E. coli bacteria samples collected in any calendar month can exceed 410 counts/100 mL.

**Ammonia:** Ammonia limits were calculated using current acute and chronic ammonia toxicity criteria for the protection of aquatic life are included in Tables 2C and 4B of ch. NR 105, Wis. Adm. Code. Subchapter IV of ch. NR 106 establishes the procedure for calculating WQBELs for ammonia. The daily maximum variable, weekly average and monthly average limits remain unchanged from the previous permit.

**Temperature:** Casco submitted a dissipative cooling (DC) study in 2019 pursuant to s. NR 106.59(4), Wis. Adm. Code. The DC study was approved and demonstrated that instream temperatures returned to ambient conditions downstream of the outfall.

The permittee may request continued consideration of DC in accordance with s. NR 106.59(8), Wis. Adm. Code. The permittee's request must: 1) be submitted with the permit reissuance application; 2) certify that there has been no substantive change in operations or loadings since the previous permit application; 3) include any new information generated during the current permit term with certification that it is consistent with the previous permit application. The permittee submitted this continuation request of DC certifying that there has been no substantive change in operations or loadings since the previous permit application and it was included with the permit application received on April 4, 2024.

The department has granted approval of the continuation request of DC for this permit term and temperature limits are not necessary in the reissued permit. However, the department has included weekly maximum temperature monitoring in 2029 to capture any changes in thermal loadings and evaluate reasonable potential in the next permit reissuance.

**TMDL derived Total Phosphorus Mass Effluent Limitations:** Phosphorus requirements are based on the Phosphorus Rules as detailed in chs. NR 102 (water quality standards) and NR 217, Wis. Adm. Code (effluent standards and limitations for phosphorus). Chapter NR 217 of the Wis. Adm. Code addresses point source dischargers of phosphorus to surface waters. Currently, there are three types of limit calculations used to determine if a phosphorus limit is needed: a technology based effluent limit (TBEL), a WQBEL determined by stream criteria and an effluent limit based on a TMDL allocation.

- A TBEL of 1.0 mg/L is needed if a facility discharges more than the threshold of 150 pounds per month (s. NR 217.04(1)(a)1., Wis. Adm. Code). The data demonstrates that the annual monthly average phosphorus loading is less than 150 lbs/month. However, an interim limit of 1.0 mg/L went into effect per the MDV compliance schedules and will remain in effect pursuant to ch. NR 207, Wis. Adm. Code, unless a more stringent limit is required at a future permit issuance by ss. NR 217.13 and NR 217.16(2), Wis. Adm. Code.
- The final total phosphorus WQBELs were determined to be 0.225 mg/L as a monthly average, 0.075 mg/L as a six-month average, and 0.063 lbs/day as a six-month average. These limits had yet to take effect per the multi-discharger variance in the previous permit. The department has determined to include the total phosphorus TMDL derived limitations in lieu of the WQBELs calculated under s. NR 217.13, Wis. Adm. Code, pursuant to s. NR 217.16, Wis. Adm. Code.
- The permittee discharges to Casco Creek which is within the Northeast Lakeshore Basin TMDL area. The Northeast Lakeshore Basin TMDL for total phosphorus and total suspended solids was approved by the USEPA on October 30, 2023. If the department determines a WQBEL is necessary, limitations shall be consistent with a TMDL if a TMDL has been approved by the USEPA for the receiving waterbody consistent with s. NR 205.067(3)(a), Wis. Adm. Code. The department has determined that total phosphorus WQBELs are necessary. Therefore, the department must also calculate TMDL derived total phosphorus limits to be consistent with the Northeast Lakeshore Basin TMDL. The approved total phosphorus WLA for the permittee is 546 lbs/year. Since the equivalent concentration is greater than 0.3 mg/L, the WLA should be expressed as a monthly average mass limit for total phosphorus and no six-month average limit is required. The department calculated a total phosphorus mass limit of 2.2 lbs/day as a monthly average. Since the total phosphorus WLA is expressed as an annual load (lbs/yr), the permittee must also calculate and report the rolling 12-month sums of total monthly loads for total phosphorus. Rolling 12-month sums can be compared directly to the annual wasteload allocation. Based on the effluent total phosphorus data submitted on eDMRs from January 2020 to January 2025, the permittee can currently meet the total phosphorus mass limit, and a compliance schedule is not needed.

**Chloride:** Effluent chloride concentrations are below the calculated QBELs; therefore, limits are not required. However, monthly monitoring is required in 2029 to ensure that 11 sample results are available at the next permit reissuance to meet the reasonable potential data requirements of s. NR 106.85, Wis. Adm. Code.

**Nitrogen Series Monitoring (NO<sub>2</sub>+NO<sub>3</sub>, TKN and Total N):** The department has included annual effluent monitoring for total nitrogen in rotating quarters since the permittee is a minor discharge (<1 MGD) in the permit through the authority under s. 283.55(1)(e), Wis. Stats., which allows the department to require the permittee to submit information necessary to identify the type and quantity of any pollutants discharged from the point source. More information on the justification to include total nitrogen monitoring in wastewater permits can be found in the “Guidance for Total Nitrogen Monitoring in Wastewater Permits” dated October 1, 2019.

**Whole Effluent Toxicity Testing:** Whole effluent toxicity (WET) testing requirements and limits are determined in accordance with ss. NR 106.08 and NR 106.09, Wis. Adm. Code, as revised August 2016. (See the current version of the Whole Effluent Toxicity Program Guidance Document and checklist and WET information, guidance and test methods at <http://dnr.wisconsin.gov/topic/wastewater/wet.html>).

After consideration of the guidance provided in the Department's WET Program Guidance Document (2019) and other information described above, 3 x chronic WET tests during the permit term are included in the reissued permit. Tests should be done in rotating quarters to collect seasonal information about this discharge.

**PFOS and PFOA:** NR 106 Subchapter VIII – Permit Requirements for PFOS and PFOA Dischargers became effective on August 1, 2022. Pursuant to s. NR 106.98(3)(b), Wis. Adm. Code, the department evaluated the need for PFOS and PFOA monitoring taking into consideration the presence of potential PFOS or PFOA industrial wastes, remediation sites and other potential sources of PFOS or PFOA. Based on information available at the time the proposed permit was drafted, the department has determined the permittee does not need to sample for PFOS or PFOA in the effluent as part of this permit reissuance. The department may re-evaluate the need for sampling at the next permit reissuance if new information becomes available that suggests PFOS or PFOA may be present in the discharge.

**Sample Frequency:** The department shall determine on a case-by-case basis the monitoring frequency to be required for each parameter in a permit pursuant to s. NR 205.066, Wis. Adm. Code. The Monitoring Frequencies for Individual Wastewater Permits guidance (April 12, 2021) recommends that standard monitoring frequencies be included in individual WPDES permits based on the size and type of the facility, in order to characterize effluent quality and variability, to detect events of noncompliance, and to ensure fairness and consistency in permits issued across the state. Guidance and requirements in administrative code were considered when determining the appropriate monitoring frequencies for pollutants that have final effluent limits in effect during this permit term.

Previously permitted monitoring frequencies for BOD<sub>5</sub>, TSS, ammonia nitrogen, and total phosphorus are consistent with the standard monitoring frequency outlined in the guidance. The sampling frequencies for BOD<sub>5</sub>, TSS, ammonia nitrogen, and total phosphorus remain unchanged from the previous permit. Monitoring frequency for E. coli is consistent with the standard monitoring frequency for fecal coliform. Previously permitted monitoring frequencies for pH and DO fall below the standard monitoring frequencies outlined in the guidance document. The department has determined at this time to increase the monitoring frequency for pH and DO to be consistent with standard monitoring frequencies outlined in the guidance document.

**Sample Type:** The department shall require the use of 24-hour flow proportional samplers for monitoring effluent wastewater quality except where the department determines through the permit issuance process that other sample types may adequately characterize the effluent quality pursuant to s. NR 210.04(4), Wis. Adm. Code. The 24-hour flow-proportional sampling is the most representative method of collecting wastewater samples for wastewater coming into and being discharged from a wastewater treatment plant on a continuous basis. Grab samples for pH, DO, and E. coli are required as compositing and holding such samples would change the test results and is noncompliant with maximum holding times specified in ch. NR 219, Wis. Adm. Code. The sample type for all parameters remains unchanged from the previous permit.

### 3 Land Application - Monitoring and Limitations

Municipal Sludge Description						
Sample Point	Sludge Class (A or B)	Sludge Type (Liquid or Cake)	Pathogen Reduction Method	Vector Attraction Method	Reuse Option	Amount Reused/Disposed (Dry Metric Tons/Year)
002	B	Liquid	Fecal Coliform	Injection or Incorporation	Land Application	5.7 (2019 to 2024)
Does sludge management demonstrate compliance? <b>Yes.</b>						
Is additional sludge storage required? <b>No.</b>						
Is Radium-226 present in the water supply at a level greater than 2 pCi/liter? <b>No.</b>						
If yes, special monitoring and recycling conditions will be included in the permit to track any potential problems in land applying sludge from this facility						
Is a priority pollutant scan required? <b>No.</b>						
Priority pollutant scans are required once every 10 years at facilities with design flows between 5 MGD and 40 MGD, and once every 5 years if design flow is greater than 40 MGD.						

#### 3.1 Sample Point Number: 002- Liquid Sludge

Monitoring Requirements and Limitations					
Parameter	Limit Type	Limit and Units	Sample Frequency	Sample Type	Notes
Solids, Total		Percent	Annual	Composite	
Arsenic Dry Wt	Ceiling	75 mg/kg	Annual	Composite	Limits applicable only when the liquid sludge is land applied in any year.
Arsenic Dry Wt	High Quality	41 mg/kg	Annual	Composite	
Cadmium Dry Wt	Ceiling	85 mg/kg	Annual	Composite	
Cadmium Dry Wt	High Quality	39 mg/kg	Annual	Composite	
Copper Dry Wt	Ceiling	4,300 mg/kg	Annual	Composite	
Copper Dry Wt	High Quality	1,500 mg/kg	Annual	Composite	
Lead Dry Wt	Ceiling	840 mg/kg	Annual	Composite	
Lead Dry Wt	High Quality	300 mg/kg	Annual	Composite	
Mercury Dry Wt	Ceiling	57 mg/kg	Annual	Composite	
Mercury Dry Wt	High Quality	17 mg/kg	Annual	Composite	

Monitoring Requirements and Limitations					
Parameter	Limit Type	Limit and Units	Sample Frequency	Sample Type	Notes
Molybdenum Dry Wt	Ceiling	75 mg/kg	Annual	Composite	
Nickel Dry Wt	Ceiling	420 mg/kg	Annual	Composite	
Nickel Dry Wt	High Quality	420 mg/kg	Annual	Composite	
Selenium Dry Wt	Ceiling	100 mg/kg	Annual	Composite	
Selenium Dry Wt	High Quality	100 mg/kg	Annual	Composite	
Zinc Dry Wt	Ceiling	7,500 mg/kg	Annual	Composite	
Zinc Dry Wt	High Quality	2,800 mg/kg	Annual	Composite	
Nitrogen, Total Kjeldahl		Percent	Annual	Composite	
Nitrogen, Ammonium (NH4-N) Total		Percent	Annual	Composite	
Phosphorus, Total		Percent	Annual	Composite	
Phosphorus, Water Extractable		% of Tot P	Annual	Composite	
Potassium, Total Recoverable		Percent	Annual	Composite	
PFOA + PFOS		ug/kg	Annual	Calculated	Report the sum of PFOA and PFOS. See PFAS Permit Sections for more information.
PFAS Dry Wt			Annual	Grab	Perfluoroalkyl and Polyfluoroalkyl Substances based on updated DNR PFAS List. See PFAS Permit Sections for more information.

### Changes from Previous Permit:

- Annual PFAS monitoring has been added to the permit.
- PCB monitoring once during the permit has been removed.

### Explanation of Limits and Monitoring Requirements

**Metals, Nutrients, Pathogen Control, Vector Attraction Reduction:** The parameters to be analyzed in the sludge were determined pursuant to s. NR 204.06(2)(b), Wis. Adm. Code. The ceiling and high-quality limits for metals in sludge are specified in s. NR 204.07(5), Wis. Adm. Code. Requirements for pathogen control are specified in s. NR 204.07(6), Wis. Adm. Code and in s. NR 204.07(7), Wis. Adm. Code for vector attraction reduction requirements. Nutrients are required to be analyzed to track that nutrient recommendations for the crop are not exceeded. Specifically, the amount of available

nitrogen from sludge and other nitrogen sources applied per growing season may not exceed the nitrogen requirement of the crop pursuant to s. NR 204.07(8)(a), Wis. Adm. Code.

**PFAS:** The presence and fate of PFAS in municipal and industrial sludges is an emerging public health concern. EPA has developed a draft risk assessment to determine future land application rates and released this risk assessment in January of 2025. The department is evaluating this new information. Until a decision is made, the “Interim Strategy for Land Application of Biosolids and Industrial Sludges Containing PFAS” should be followed.

Collecting sludge data on PFAS concentrations from a wide range of wastewater treatment facilities will help protect public health from exposure to elevated levels of PFAS and determine the department’s implementation of EPA’s recommendations. To quantitate this risk, PFAS sampling has been included in this WPDES permit pursuant to ss. NR 214.18(5)(b) and NR 204.06(2)(b)9., Wis. Adm. Code.

**Sample Frequency:** The frequency of monitoring for metals, nutrients, pathogen control, and vector attraction reduction requirements of the sludge is based on the amount of sludge land applied each year pursuant to s. NR 204.06(2)(c)3., Wis. Adm. Code. The facility generated and distributed an annual average of 5.7 dry metric tons each year (2019 to 2024). This result is less than 290 dry metric tons of sludge each year based on Table A in s. NR 204.06(2)(c)3., Wis. Adm. Code, which results in a sampling frequency of once per year. The sample frequency remains unchanged from the previous permit.

**PCB monitoring:** PCB monitoring is not required this permit term but will be included in the next reissuance. There are no potential industrial sources and a review of historic PCB data shown results well below high quality and ceiling limitations as stated in s. NR 204.07(3)(k), Wis. Adm. Code.

## 4 Schedules

### 4.1 Phosphorus Payment per Pound to County

The permittee is required to make annual payments for phosphorus reductions to the participating county or counties in accordance with s. 283.16(8), Wis. Stats, and the following schedule. The price per pound will be set at the time of permit reissuance and will apply for the duration of the permit.

Required Action	Due Date
<p><b>Annual Verification of Payment:</b> Submit Form 3200-151 to the Department indicating total amount remitted to the participating counties for January to March 2026 when the MDV was still effective. The amount due is equal to the following: [(lbs of phosphorus discharged minus the permittee’s target value) times (\$53.01 per pound)] or \$640,000, whichever is less.</p> <p>Note: The applicable Target Value is 0.2 mg/L as defined by s. 283.16(1)(h), Wis. Stats. The "per pound" value is \$50.00 adjusted for CPI.</p>	03/01/2027

#### Explanation of Schedule

Subsection 283.16(6)(b), Wis. Stats., requires permittees that have received approval for the MDV to implement a watershed project that is designed to reduce non-point sources of phosphorus within the watershed in which the permittee is located. The permittee had previously selected the “Payment to Counties” watershed option described in s. 283.16(8), Wis. Stats. Under this option the permittee shall make annual payment(s) to participating county(s) when the MDV was still effective in January to March 2026. This schedule serves as a reminder to the permittee to submit Form 3200-151 to the department indicating the total amount remitted to the participating county(s).

### 4.2 Install Continuous Flow Recording Device

The permittee shall install a continuous flow recording device at Sampling Point 701 (Influent) in accordance with the following schedule.

Required Action	Due Date
<p><b>Submit Final Plans and Specifications:</b> Submit plans and specifications per ch. NR 108, Wis. Adm. Code, for installing a continuous flow recording device at Sampling Point 701 (Influent).</p>	09/30/2028
<p><b>Complete Install:</b> The permittee shall complete installation of the continuous flow recording device at Sampling Point 701 (Influent).</p>	03/31/2029

#### Explanation of Schedule

The permittee currently measures the effluent flow rate but not influent flow rate. However, monitoring for influent flow is required by s. NR 210.04(2), Wis. Adm. Code, to assess wastewater strengths and volumes and to demonstrate the percent removal requirements in s. NR 210.05, Wis. Adm. Code. This schedule requires the permittee to install a continuous influent flow recording device to comply with s. NR 210.04(2), Wis. Adm. Code.

### 4.3 Sludge Management Plan

A management plan is required for the sludge management program.

Required Action	Due Date
<p><b>Sludge Management Plan Submittal:</b> Submit a sludge management plan to optimize the land application system performance and demonstrate compliance with ch. NR 204, Wis. Adm. Code, by the Due Date. This management plan shall 1) specify information on pretreatment processes (if any); 2) identify land application sites; 3) describe site limitations; 4) address vegetative cover management and removal; 5) specify availability of storage; 6) describe the type of transporting and spreading vehicle(s); 7) specify monitoring procedures; 8) track site loading; 9) address contingency plans for adverse weather and odor/nuisance abatement; and 10) include any other pertinent information. Once approved, all sludge management activities shall be conducted in accordance with the plan. Any changes to the plan must be approved by the Department prior to implementing the changes.</p>	03/31/2027

#### Explanation of Schedule

Per s. NR 204.11(1), Wis. Adm. Code, the department may require the permittee to develop a sludge management plan, submit the plan to the department for approval and operate in compliance with the approved plan. The plan shall include a description of the facility’s sludge management program and how the permittee plans to operate the facility in compliance with the requirements of the permit and ch. NR 204, Wis. Adm. Code. The sludge management plan shall be submitted to the department for approval by the due date in the permit.

### 4.4 SS (Sanitary Sewage Collection System) Subclass

The permittee is required to have a designated collection system operator-in-charge (OIC) for the sanitary sewage collection system. The designated OIC shall have passed and be certified in the SS (Sanitary Sewage Collection System) subclass pursuant to s. NR 114.53(2), Wis. Adm. Code.

Required Action	Due Date
<p><b>Operator Certification:</b> The permittee shall designate one person to be the operator-in-charge (OIC) for the sanitary sewage collection system and obtain the SS (Sanitary Sewage Collection System) subclass at the basic level. The designated OIC will have 24 months to pass the exam for the SS (Sanitary Sewage Collection System) subclass and submit the operator experience form for one year of subclass specific experience to be certified at the basic level pursuant to s. NR 114.53(4), Wis. Adm. Code.</p>	03/31/2028

#### Explanation of Schedule

The permittee is required to have a designated collection system operator-in-charge (OIC) for the sanitary sewage collection system. The designated OIC shall have passed and be certified in the SS (Sanitary Sewage Collection System) subclass pursuant to s. NR 114.53(2), Wis. Adm. Code. The OIC will have 24 months to pass the exam for the SS (Sanitary Sewage Collection System) subclass and submit the one year of subclass specific experience to be certified at the basic level pursuant to s. NR 114.53(4), Wis. Adm. Code. This schedule serves as a reminder of the operator certification requirements.

## 5 Standard Requirements

The Standard Requirements section contains conditions and requirements that are, for the most part, applicable to all municipal permittees consistent with ss. NR 205.07(1) and NR 205.07(2), Wis. Adm. Code. Other standard requirements are added as reminders. Changes to the standard requirements section include:

- Section 5.1.4: The limit of quantitation was updated for TSS for purposes of calculating NR 101 fees.
- Section 5.4.7: The department has added a reminder about the expression of the E. coli limits and to enter a value of 1 for a result of 0 when calculating the geometric mean. This section has replaced fecal coliform from the previous permit.
- Sections 5.4.9 – 5.4.10: Due to the need for chronic WET testing monitoring, the department has added the standard WET monitoring requirements and requirements to be followed in case of a WET retest failure.
- Sections 5.5.11 to 5.5.15: The department has added all applicable sludge treatment process, pathogen control and vector attraction reduction requirements that may be applicable to the permittee.
- Section on monitoring and calculation requirements for PCB Concentrations in Sludge has been removed as the permittee is not required to monitoring for PCBs in the sludge this permit term.

## 6 Summary of Reports Due

A summary of reports due has been added for informational purposes for the permittee to keep track of the due dates of reports and schedule items.

## Other Comments/Changes from Previous Permit

None.

## Justification Of Any Waivers from Permit Application Requirements

No waivers requested or granted as part of this permit reissuance.

## Attachments:

“Water Quality-Based Effluent Limitations for Casco Wastewater Treatment Facility (WI-0023566-09)” memo dated March 28, 2025.

### Prepared By:

**Trevor Moen**  
**Wastewater Engineer**  
**Bureau of Water Quality**

**Date: 01/30/2026**

**Post Fact Check Revision Date: 02/13/2026**

**Post Public Notice Revision Date:**

**CORRESPONDENCE/MEMORANDUM**

DATE: 03/28/2025

TO: Sarah Adkins – NER

FROM: Nicole Krueger – SER *Nicole Krueger*

SUBJECT: Water Quality-Based Effluent Limitations for Casco Wastewater Treatment Facility  
WPDES Permit No. WI-0023566-09

This is in response to your request for an evaluation of the need for water quality-based effluent limitations (WQBELs) using chapters NR 102, 104, 105, 106, 207, 210, 212, and 217 of the Wisconsin Administrative Code (where applicable) for the discharge from Casco Wastewater Treatment Facility in Kewaunee County. This municipal wastewater treatment facility (WWTF) discharges to Casco Creek, located in the Kewaunee River Watershed in the Northeast Lakeshore Basin. This discharge is included in the Northeast Lakeshore Basin TMDL as approved by EPA in October 2023. The evaluation of the permit recommendations is discussed in more detail in the attached report.

Based on our review, the following recommendations are made on a chemical-specific basis at Outfall 001:

Parameter	Daily Maximum	Daily Minimum	Weekly Average	Monthly Average	Footnotes
Flow Rate					1,2
BOD <sub>5</sub>			10 mg/L	10 mg/L	1
TSS TMDL			10 mg/L 37 lbs/day	10 mg/L 26 lbs/day	3
pH	9.0 s.u.	6.0 s.u.			1
Dissolved Oxygen		7.0 mg/L			1
Bacteria					4
Final Limit <i>E. coli</i>				126 #/100 mL geometric mean	
Ammonia Nitrogen June – October November – March April & May	Variable Variable Variable		9.3 mg/L 9.5 mg/L 6.6 mg/L	5.6 mg/L 4.7 mg/L 3.4 mg/L	5
Temperature					2
Phosphorus TMDL				1.0 mg/L 2.2 lbs/day	3
Chloride					6
TKN, Nitrate+Nitrite, and Total Nitrogen					7
Chronic WET					8,9

Footnotes:

1. No changes from the current permit.
2. Monitoring only.
3. The TSS and phosphorus mass limits are based on the Total Maximum Daily Load (TMDL) for the Northeast Lakshore Basin to address phosphorus water quality impairments within the TMDL area. The TMDL was approved by EPA in October 2023.

4. Bacteria limits apply during the disinfection season of May through September. Additional final limit: No more than 10 percent of *E. coli* bacteria samples collected in any calendar month may exceed 410 count/100 mL.
5. The variable daily maximum ammonia nitrogen limit table corresponding to various effluent pH values may be included in the permit in place of the single limit. These limits apply year-round.

Effluent pH s.u.	Limit mg/L	Effluent pH s.u.	Limit mg/L	Effluent pH s.u.	Limit mg/L
6.0 ≤ pH ≤ 6.1	72	7.0 < pH ≤ 7.1	44	8.0 < pH ≤ 8.1	9.3
6.1 < pH ≤ 6.2	71	7.1 < pH ≤ 7.2	39	8.1 < pH ≤ 8.2	7.6
6.2 < pH ≤ 6.3	69	7.2 < pH ≤ 7.3	35	8.2 < pH ≤ 8.3	6.3
6.3 < pH ≤ 6.4	67	7.3 < pH ≤ 7.4	31	8.3 < pH ≤ 8.4	5.2
6.4 < pH ≤ 6.5	65	7.4 < pH ≤ 7.5	27	8.4 < pH ≤ 8.5	4.3
6.5 < pH ≤ 6.6	63	7.5 < pH ≤ 7.6	23	8.5 < pH ≤ 8.6	3.5
6.6 < pH ≤ 6.7	60	7.6 < pH ≤ 7.7	19	8.6 < pH ≤ 8.7	3.0
6.7 < pH ≤ 6.8	56	7.7 < pH ≤ 7.8	16	8.7 < pH ≤ 8.8	2.5
6.8 < pH ≤ 6.9	52	7.8 < pH ≤ 7.9	14	8.8 < pH ≤ 8.9	2.1
6.9 < pH ≤ 7.0	48	7.9 < pH ≤ 8.0	11	8.9 < pH ≤ 9.0	1.8

6. Monitoring at a frequency to ensure that 11 samples are available at the next permit issuance.
7. As recommended in the Department's October 1, 2019 Guidance for Total Nitrogen Monitoring in Wastewater Permits, annual total nitrogen monitoring is recommended for all minor municipal permittees. Total Nitrogen is the sum of nitrate (NO<sub>3</sub>), nitrite (NO<sub>2</sub>), and total Kjeldahl nitrogen (TKN) (all expressed as N).
8. 3x/permit term chronic WET monitoring is recommended in the reissued permit. The Instream Waste Concentration (IWC) to assess chronic test results is 66%. According to the *State of Wisconsin Aquatic Life Toxicity Testing Methods Manual* (s. NR 219.04, Table A, Wis. Adm. Code), chronic testing shall be performed using a dilution series of 100%, 75%, 50%, 25% & 12.5%. The primary control water used in chronic WET tests conducted on Outfall 001 shall be a grab sample collected from Casco Creek.
9. Sampling WET concurrently with any chemical-specific toxic substances is recommended. Tests should be done in rotating quarters, to collect seasonal information about this discharge.

Please consult the attached report for details regarding the above recommendations. If there are any questions or comments, please contact Nicole Krueger at [Nicole.Krueger@wisconsin.gov](mailto:Nicole.Krueger@wisconsin.gov) or Diane Figiel at [Diane.Figiel@wisconsin.gov](mailto:Diane.Figiel@wisconsin.gov).

Attachments (3) – Narrative, Outfall Map, & Thermal Table

PREPARED BY: Nicole Krueger, Water Resources Engineer – SER

E-cc: Dave Haas, Wastewater Engineer – NER  
 Heidi Schmitt Marquez, Regional Wastewater Supervisor – NER  
 Diane Figiel, Water Resources Engineer – WY/3  
 Nate Willis, Wastewater Engineer – WY/3

Attachment #1  
**Water Quality-Based Effluent Limitations for  
 Casco Wastewater Treatment Facility**

**WPDES Permit No. WI-0023566-09**

Prepared by: Nicole Krueger

**PART 1 – BACKGROUND INFORMATION**

**Facility Description**

The Village of Casco, in Kewaunee County, owns and operates a tertiary wastewater treatment facility (WWTF) designed for an average daily flow of 0.101 MGD. Treatment processes include preliminary treatment with a mechanical fine screen, secondary biological treatment in an activated sludge system (operating in the extended aeration mode) consisting of a pair of aeration basins followed by a final clarifier, tertiary filtration with sand media filters and seasonal disinfection with ultraviolet (UV). Treated effluent is discharged to Casco Creek via Outfall 001. Sludge is aerobically digested and stored until land application on agricultural lands.

Attachment #2 is a map of the area showing the approximate location of Outfall 001.

**Existing Permit Limitations**

The current permit, which expired on 09/30/2024, includes the following effluent limitations and monitoring requirements.

Parameter	Daily Maximum	Daily Minimum	Weekly Average	Monthly Average	Six-Month Average	Footnotes
Flow Rate						1
BOD <sub>5</sub>			10 mg/L	10 mg/L		2
TSS			10 mg/L	10 mg/L		2
pH	9.0 s.u.	6.0 s.u.				2
Dissolved Oxygen		7.0 mg/L				2
Fecal Coliform May – September			<b>656#/100 mL geometric mean</b>	400#/100 mL geometric mean		3
Ammonia Nitrogen June – October November – March April & May	Variable Variable Variable		9.3 mg/L 9.5 mg/L 6.6 mg/L	5.6 mg/L 4.7 mg/L 3.4 mg/L		4
Temperature						1
Phosphorus MDV Interim Final				1.0 mg/L 0.225 mg/L	0.075 mg/L 0.063 lbs/day	
Chloride						1

Footnotes:

1. Monitoring only.

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2. These limitations are not being evaluated as part of this review. Because the water quality criteria (WQC), reference effluent flow rates, and receiving water characteristics have not changed, limitations for these water quality characteristics do not need to be re-evaluated at this time.
3. Additional limits to comply with the expression of limits requirements in ss. NR 106.07 and NR 205.065(7), Wis. Adm. Codes, are included in bold.
4. The year-round variable ammonia daily maximum limits are shown below.

Effluent pH s.u.	Limit mg/L	Effluent pH s.u.	Limit mg/L	Effluent pH s.u.	Limit mg/L
6.0 ≤ pH ≤ 6.1	72	7.0 < pH ≤ 7.1	44	8.0 < pH ≤ 8.1	9.3
6.1 < pH ≤ 6.2	71	7.1 < pH ≤ 7.2	39	8.1 < pH ≤ 8.2	7.6
6.2 < pH ≤ 6.3	69	7.2 < pH ≤ 7.3	35	8.2 < pH ≤ 8.3	6.3
6.3 < pH ≤ 6.4	67	7.3 < pH ≤ 7.4	31	8.3 < pH ≤ 8.4	5.2
6.4 < pH ≤ 6.5	65	7.4 < pH ≤ 7.5	27	8.4 < pH ≤ 8.5	4.3
6.5 < pH ≤ 6.6	63	7.5 < pH ≤ 7.6	23	8.5 < pH ≤ 8.6	3.5
6.6 < pH ≤ 6.7	60	7.6 < pH ≤ 7.7	19	8.6 < pH ≤ 8.7	3.0
6.7 < pH ≤ 6.8	56	7.7 < pH ≤ 7.8	16	8.7 < pH ≤ 8.8	2.5
6.8 < pH ≤ 6.9	52	7.8 < pH ≤ 7.9	14	8.8 < pH ≤ 8.9	2.1
6.9 < pH ≤ 7.0	48	7.9 < pH ≤ 8.0	11	8.9 < pH ≤ 9.0	1.8

**Receiving Water Information**

- Name: Casco Creek
  - Waterbody Identification Code (WBIC): 91600
  - Classification used in accordance with chs. NR 102 and 104, Wis. Adm. Code: Cold Water (Class II), nonpublic water supply. Note: Cold Water and Public Water Supply criteria are used for bioaccumulating compounds of concern, because the discharge is within the Great Lakes basin.
    - At Rockledge Rd, approximately one mile downstream of the discharge, Casco Creek is classified as a Class I trout water and an Exceptional Resource Water (ERW).
  - Low flows used in accordance with chs. NR 106 and 217, Wis. Adm. Code: The following 7-Q<sub>10</sub> and 7-Q<sub>2</sub> values are from station TK19, where Outfall 001 is located.
    - 7-Q<sub>10</sub> = 0.32 cubic feet per second (cfs)
    - 7-Q<sub>2</sub> = 0.92 cfs
    - Harmonic Mean Flow = 1.8 cfs using a drainage area of 10.1 mi<sup>2</sup>
- The Harmonic Mean has been estimated based on average flow and the 7-Q<sub>10</sub> using an equation from U.S. EPA's *Technical Support Document for Water Quality-Based Toxics Control* (March 1991, EPA/505/2-90-001, pgs. 88-89).

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
7-Q <sub>10</sub> (cfs)	0.50	0.57	0.82	1.7	1.0	0.65	0.47	0.36	0.37	0.50	0.60	0.55
7-Q <sub>2</sub> (cfs)	1.6	1.8	3.5	5.5	3.1	2.1	1.3	1.1	1.2	1.5	2.0	1.8

- Hardness = mg/L as CaCO<sub>3</sub>. This value represents the geometric mean of data from
- % of low flow used to calculate limits in accordance with s. NR 106.06(4)(c)5., Wis. Adm. Code: 25%
- Source of background concentration data: Metals data the Kewaunee River is used for this evaluation because there is no data available for Casco Creek. The Kewaunee River is within the same

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ecological landscape so ambient water quality characteristics are expected to be similar. The numerical values are shown in the tables below. If no data is available, the background concentration is assumed to be negligible and a value of zero is used in the computations. Background data for calculating effluent limitations for ammonia nitrogen are described later.

- Multiple dischargers: None.
- Impaired water status: Casco Creek at Rockledge Road is 303(d) listed as impaired for total phosphorus.

**Effluent Information**

- Design flow rate(s):  
 Annual average = 0.101 million gallons per day (MGD)  
 For reference, the actual average flow from 01/01/2020 – 01/31/2025 was 0.073 MGD.
- Hardness = 393 mg/L as CaCO<sub>3</sub>. This value represents the geometric mean of four samples collected in February 2024 which were reported on the permit application.
- Acute dilution factor used in accordance with s. NR 106.06(3)(c), Wis. Adm. Code: Not applicable – this facility does not have an approved Zone of Initial Dilution (ZID).
- Wastewater source: Domestic wastewater with no industrial contributors.
- Water supply: Private wells.
- Additives: Ferric chloride is used for phosphorus removal.
- Effluent characterization: This facility is categorized as a minor municipality, so the permit application required effluent sample analyses for a limited number of common pollutants, as specified in s. NR 200.065, Table 1, Wis. Adm. Code, primarily metal substances plus ammonia, chloride, hardness and phosphorus.
- Effluent data for substances for which a single sample was analyzed is shown in the tables in Part 2, in the column titled “MEAN EFFL. CONC.”. Otherwise, substances with multiple effluent data are shown in the tables below or in their respective parts in this evaluation.

**Copper Effluent Data**

Sample Date	Copper (µg/L)	Sample Date	Copper (µg/L)	Sample Date	Copper (µg/L)
02/02/2024	12	02/14/2024	11	02/26/2024	10
02/05/2024	11	02/17/2024	9.8	02/29/2024	11
02/08/2024	12	02/20/2024	10	03/03/2024	9.7
02/11/2024	12	02/23/2024	9.2		
1-day P <sub>99</sub> = 13.3 µg/L					
4-day P <sub>99</sub> = 11.9 µg/L					

**Effluent Chloride Data**

Sample Date	Chloride mg/L
01/13/2021	444
02/10/2021	392
03/17/2021	368
04/14/2021	312
05/19/2021	342
06/16/2021	425
07/14/2021	399

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Sample Date	Chloride mg/L
08/17/2021	240
09/16/2021	318
10/13/2021	393
11/17/2021	473
1-day P <sub>99</sub>	550
4-day P <sub>99</sub>	457

The following table presents the average concentrations and loadings at Outfall 001 from 01/01/2020 – 01/31/2025 for all parameters with limits in the current permit to meet the requirements of s. NR 201.03(6), Wis. Adm. Code:

**Averages of Parameters with Limits**

	Average Measurement
BOD <sub>5</sub>	2.5 mg/L*
TSS	1.62 mg/L*
pH field	7.24 s.u.
Dissolved Oxygen	8.7 mg/L
Ammonia Nitrogen	0.30 mg/L*
Fecal Coliform	3.3 #/100 mL**
Phosphorus	0.32 mg/L

\*Results below the level of detection (LOD) were included as zeroes in calculation of average.

\*\* The average measurement for bacteria is calculated as a geometric mean. Values reported below the LOD are replaced with a value of 1 for the calculation of the geometric mean.

**PART 2 – WATER QUALITY-BASED EFFLUENT LIMITATIONS FOR TOXIC SUBSTANCES – EXCEPT AMMONIA NITROGEN**

Permit limits for toxic substances are required whenever any of the following occur:

1. The maximum effluent concentration exceeds the calculated limit (s. NR 106.05(3), Wis. Adm. Code)
2. If 11 or more detected results are available in the effluent, the upper 99<sup>th</sup> percentile (or P<sub>99</sub>) value exceeds the comparable calculated limit (s. NR 106.05(4), Wis. Adm. Code)
3. If fewer than 11 detected results are available, the mean effluent concentration exceeds 1/5 of the calculated limit (s. NR 106.05(6), Wis. Adm. Code)

**Acute Limits based on 1-Q<sub>10</sub>**

Daily maximum effluent limitations for toxic substances are based on the acute toxicity criteria (ATC), listed in ch. NR 105, Wis. Adm. Code. Previously daily maximum limits for toxic substances were calculated as two times the ATC. However, changes to ch. NR 106, Wis. Code, (September 1, 2016) require the Department to calculate acute limitations using the same mass balance equation as used for other limits along with the 1-Q<sub>10</sub> receiving water low flow to determine if more restrictive effluent limitations are needed to protect the receiving stream from discharges which may cause or contribute to an exceedance of the acute water quality standards. The mass balance equation is provided below.

$$\text{Limitation} = \frac{(\text{WQC}) (Q_s + (1-f) Q_e) - (Q_s - f Q_e) (C_s)}{Q_e}$$

Where:

WQC = Acute toxicity criterion or secondary acute value according to ch. NR 105, Wis. Adm. Code.

Q<sub>s</sub> = average minimum 1-day flow which occurs once in 10 years (1-day Q<sub>10</sub>)  
 if the 1-day Q<sub>10</sub> flow data is not available = 80% of the average minimum 7-day flow which occurs once in 10 years (7-day Q<sub>10</sub>).

Q<sub>e</sub> = Effluent flow (in units of volume per unit time) as specified in s. NR 106.06(4)(d), Wis. Adm. Code.

f = Fraction of the effluent flow that is withdrawn from the receiving water, and

C<sub>s</sub> = Background concentration of the substance (in units of mass per unit volume) as specified in s. NR 106.06(4)(e), Wis. Adm. Code.

If the receiving water is effluent dominated under low stream flow conditions, the 1-Q<sub>10</sub> method of limit calculation produces the most stringent daily maximum limitations and should be used while making reasonable potential determinations. This is not the case for Casco, and the limits are set based on two times the acute toxicity criteria.

The following tables list the calculated WQBELs for this discharge along with the results of effluent sampling. All concentrations are expressed in terms of micrograms per Liter (µg/L), except for hardness and chloride (mg/L).

**Daily Maximum Limits based on Acute Toxicity Criteria (ATC)**

RECEIVING WATER FLOW = 0.26 cfs, (1-Q<sub>10</sub> (estimated as 80% of 7-Q<sub>10</sub>)), as specified in s. NR 106.06(3)(bm), Wis. Adm. Code.

SUBSTANCE	REF. HARD.* mg/L	ATC	MEAN BACK-GRD.	MAX. EFFL. LIMIT**	1/5 OF EFFL. LIMIT	MEAN EFFL. CONC.	1-day P <sub>99</sub>	1-day MAX. CONC.
Arsenic		340		680	136	0.3		
Cadmium	394	49.7	0.70	99.4	19.9	<0.3		
Chromium	301	4446		8892	1778	<1.3		
Copper	394	56.6		113			13.3	12
Lead	356	365		729	146	<3.5		
Nickel	268	1080		2161	432	4.6		
Zinc	333	345		689	138	19		
Chloride (mg/L)		757	29	1514			550	473

\* The indicated hardness may differ from the effluent hardness because the effluent hardness exceeded the maximum range in ch. NR 105, Wis. Adm. Code, over which the acute criteria are applicable. In that case, the maximum of the range is used to calculate the criterion.

\*\* Per the changes to s. NR 106.07(3), Wis. Adm. Code, effective 09/01/2016 consideration of ambient concentrations and 1-Q<sub>10</sub> flow rates yields a more restrictive limit than the 2 × ATC method of limit calculation.

**Weekly Average Limits based on Chronic Toxicity Criteria (CTC)**

RECEIVING WATER FLOW = 0.08 cfs (1/4 of the 7-Q<sub>10</sub>), as specified in s. NR 106.06(4)(c), Wis. Adm. Code

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SUBSTANCE	REF. HARD.* mg/L	CTC	MEAN BACK-GRD.	WEEKLY AVE. LIMIT	1/5 OF EFFL. LIMIT	MEAN EFFL. CONC.	4-day P <sub>99</sub>
Arsenic		152		230	46.0	0.3	
Cadmium	175	3.82	0.70	5.42	1.1	<0.3	
Chromium	301	326		493	98.5	<1.3	
Copper	393	33.4		50.5			11.9
Lead	356	95.5		144	28.9	<3.5	
Nickel	268	120		182	36.3	4.60	
Zinc	333	345		521	104	19	
Chloride (mg/L)		395	29	582			457

\* The indicated hardness may differ from the receiving water hardness because the receiving water hardness exceeded the maximum range in ch. NR 105, Wis. Adm. Code, over which the chronic criteria are applicable. In that case, the maximum of the range is used to calculate the criterion.

**Monthly Average Limits based on Wildlife Criteria (WC)**

The effluent characterization did not include any effluent sampling results for substances for which Wildlife Criteria exist.

**Monthly Average Limits based on Human Threshold Criteria (HTC)**

RECEIVING WATER FLOW = 0.45 cfs (¼ of Harmonic Mean), as specified in s. NR 106.06(4), Wis. Adm. Code.

SUBSTANCE	HTC	MEAN BACK-GRD.	MO'LY AVE. LIMIT	1/5 OF EFFL. LIMIT	MEAN EFFL. CONC.
Cadmium	370	0.70	1436	287	<0.3
Chromium (+3)	3818000		14842392	2968478	<1.3
Lead	140		544	109	<3.5
Nickel	43000		167162	33432	4.6

**Monthly Average Limits based on Human Cancer Criteria (HCC)**

RECEIVING WATER FLOW = 0.45 cfs (¼ of Harmonic Mean), as specified in s. NR 106.06(4), Wis. Adm. Code.

SUBSTANCE	HCC	MEAN BACK-GRD.	MO'LY AVE. LIMIT	1/5 OF EFFL. LIMIT	MEAN EFFL. CONC.
Arsenic	13.3		51.7	10.3	0.3

In addition to evaluating the need for limits for each individual substance for which HCC exist, s. NR 106.06(8), Wis. Adm. Code, requires the evaluation of the cumulative cancer risk. Because no effluent limits are needed based on HCC, determination of the cumulative cancer risk is not needed per s. NR 106.06(8), Wis. Adm. Code.

**Conclusions and Recommendations**

Based on a comparison of the effluent data and calculated effluent limitations, effluent limitations are not required for any toxic substances in this section.

Chloride – Considering available effluent data from the current permit term (01/13/2021 – 12/15/2021), the 1-day P<sub>99</sub> chloride concentration is 550 mg/L, and the 4-day P<sub>99</sub> of effluent data is 457 mg/L.

These effluent concentrations are below the calculated WQBELs for chloride, therefore no effluent limits are needed. Chloride monitoring is recommended to ensure that 11 sample results are available at the next permit issuance to meet the data requirements of s. NR 106.85, Wis. Adm. Code.

Mercury – The permit application did not require monitoring for mercury because Casco is categorized as a minor facility as defined in s. NR 200.02(8), Wis. Adm. Code. In accordance with s. NR 106.145(3)(a)3, Wis. Adm. Code, a minor municipal discharger shall monitor, and report results of influent and effluent mercury monitoring once every three months if, “there are two or more exceedances in the last five years of the high-quality sludge mercury concentration of 17 mg/kg specified in s. NR 204.07(5), Wis. Adm. Code.” A review of the past five years of sludge characteristics data reveals that all the sample results are within expected analytical ranges and well below the 17 mg/kg level. The average concentration in the sludge from 10/27/2020 – 10/17/2024 was 0.08 mg/kg, with a maximum reported concentration of 0.39 mg/kg. Therefore, no mercury monitoring is recommended at Outfall 001.

PFOS and PFOA – The need for PFOS and PFOA monitoring is evaluated in accordance with s. NR 106.98(2), Wis. Adm. Code. Based on the type of discharge, the effluent flow rate, and the lack of indirect dischargers contributing to the collection system, PFOS and PFOA monitoring is not recommended. The Department may re-evaluate the need for sampling at the next permit reissuance if new information becomes available that suggests PFOS or PFOA may be present in the discharge.

### **PART 3 – WATER QUALITY-BASED EFFLUENT LIMITATIONS FOR AMMONIA NITROGEN**

The State of Wisconsin promulgated revised water quality standards for ammonia nitrogen in ch. NR 105, Wis. Adm. Code, effective March 1, 2004 which includes criteria based on both acute and chronic toxicity to aquatic life. The current permit has daily maximum, weekly average and monthly average limits. These limits are re-evaluated at this time due to the following changes:

- Subchapter IV of ch. NR 106, Wis. Adm. Code allows limits based on available dilution instead of limits set to twice the acute criteria.
- The maximum expected effluent pH has changed

#### **Daily Maximum Limits based on Acute Toxicity Criteria (ATC)**

Daily maximum limitations are based on acute toxicity criteria in ch. NR 105, Wis. Adm. Code, which are a function of the effluent pH and the receiving water classification. The acute toxicity criterion (ATC) for ammonia is calculated using the following equation:

$$\text{ATC in mg/L} = [A \div (1 + 10^{(7.204 - \text{pH})})] + [B \div (1 + 10^{(\text{pH} - 7.204)})]$$

Where:

A = 0.275 and B = 39.0 for a Cold-Water Category 1 fishery, and  
pH (s.u.) = that characteristic of the effluent.

The effluent pH data was examined as part of this evaluation. A total of 1327 sample results were reported from 01/02/2020 – 01/31/2025. The maximum reported value was 8.0 s.u. (Standard pH Units). The effluent pH was 7.8 s.u. or less 99% of the time. The 1-day P<sub>99</sub>, calculated in accordance with s. NR 106.05(5), Wis. Adm. Code, is 7.8 s.u. The mean plus the standard deviation multiplied by a factor of 2.33, an estimate of the upper ninety ninth percentile for a normally distributed dataset, is 7.8 s.u. Therefore, a value of 7.8 s.u. is believed to represent the maximum reasonably expected pH, and therefore

most appropriate for determining daily maximum limitations for ammonia nitrogen. Substituting a value of 7.8 s.u. into the equation above yields an ATC = 8.1 mg/L.

**Daily Maximum Ammonia Nitrogen Effluent Limitations Calculation Method**

In accordance with s. NR 106.32(2), Wis. Adm. Code daily maximum ammonia limitations are calculated using the the 1-Q<sub>10</sub> receiving water low flow if it is determined that the previous method of acute ammonia limit calculation (2×ATC) is not sufficiently protective of the fish and aquatic life. The more restrictive calculated limits shall apply.

The calculated daily maximum ammonia nitrogen effluent limits using the mass balance approach with the 1-Q<sub>10</sub> (estimated as 80 % of 7-Q<sub>10</sub>) and the 2×ATC approach are shown below.

**Daily Maximum Ammonia Nitrogen Determination**

	Ammonia Nitrogen Limit mg/L
2×ATC	16
1-Q <sub>10</sub>	21

The 2×ATC method yields the most stringent limits for Casco. The current permit has variable daily maximum effluent limits based on effluent pH. Presented below is a table of daily maximum limitations corresponding to various effluent pH values.

**Daily Maximum Ammonia Nitrogen Limits – Cold water**

Effluent pH s.u.	Limit mg/L	Effluent pH s.u.	Limit mg/L	Effluent pH s.u.	Limit mg/L
6.0 ≤ pH ≤ 6.1	72	7.0 < pH ≤ 7.1	44	8.0 < pH ≤ 8.1	9.3
6.1 < pH ≤ 6.2	71	7.1 < pH ≤ 7.2	39	8.1 < pH ≤ 8.2	7.6
6.2 < pH ≤ 6.3	69	7.2 < pH ≤ 7.3	35	8.2 < pH ≤ 8.3	6.3
6.3 < pH ≤ 6.4	67	7.3 < pH ≤ 7.4	31	8.3 < pH ≤ 8.4	5.2
6.4 < pH ≤ 6.5	65	7.4 < pH ≤ 7.5	27	8.4 < pH ≤ 8.5	4.3
6.5 < pH ≤ 6.6	63	7.5 < pH ≤ 7.6	23	8.5 < pH ≤ 8.6	3.5
6.6 < pH ≤ 6.7	60	7.6 < pH ≤ 7.7	19	8.6 < pH ≤ 8.7	3.0
6.7 < pH ≤ 6.8	56	7.7 < pH ≤ 7.8	16	8.7 < pH ≤ 8.8	2.5
6.8 < pH ≤ 6.9	52	7.8 < pH ≤ 7.9	14	8.8 < pH ≤ 8.9	2.1
6.9 < pH ≤ 7.0	48	7.9 < pH ≤ 8.0	11	8.9 < pH ≤ 9.0	1.8

**Weekly and Monthly Average Limits based on Chronic Toxicity Criteria (CTC)**

The weekly and monthly average ammonia nitrogen limits calculation from the previous memo do not change because there have been no changes in the effluent and receiving water flow rates. The calculations from the previous WQBEL memo are shown in Attachment #3.

**Effluent Data**

The following table evaluates the statistics based upon ammonia data reported from 01/20/2020 – 01/29/2025.

**Ammonia Nitrogen Effluent Data**

Ammonia Nitrogen mg/L	June – October	November – March	April – May
1-day P <sub>99</sub>	1.94	3.50	2.60
4-day P <sub>99</sub>	1.26	1.84	1.51
30-day P <sub>99</sub>	0.59	0.77	0.64
Mean*	0.11	0.27	0.16
Std	1.18	1.24	1.29
Sample size	394	338	326
Range	<0.034 - 9.95	<0.034 - 5.03	<0.034 - 5.92

\*Values lower than the level of detection were substituted with a zero

**Reasonable Potential**

The need to include ammonia limits in Casco’s permit is determined by calculating 99<sup>th</sup> upper percentile (or P<sub>99</sub>) values for ammonia and comparing those to the calculated limits. Based on this comparison, there is no reasonable potential for the discharge to exceed any of the calculated ammonia nitrogen limits. However, since the permit currently has daily maximum, weekly average, and monthly average limits year-round, **the limits must be retained regardless of reasonable potential**, consistent with s. NR 106.33(1)(b), Wis. Adm. Code:

- (b) If a permittee is subject to an ammonia limitation in an existing permit, the limitation shall be included in any reissued permit. Ammonia limitations shall be included in the permit if the permitted facility will be providing treatment for ammonia discharges.

**Conclusions and Recommendations**

In summary, after rounding to two significant figures, the following ammonia nitrogen limitations are recommended. No mass limitations are recommended in accordance with s. NR 106.32(5), Wis. Adm Code.

**Final Ammonia Nitrogen Limits**

	Daily Maximum mg/L	Weekly Average mg/L	Monthly Average mg/L
June – October	Variable	9.3	5.6
November – March	Variable	9.5	4.7
April & May	Variable	6.6	3.4

**PART 4 – WATER QUALITY-BASED EFFLUENT LIMITATIONS FOR BACTERIA**

On May 1, 2020, revisions to chs. NR 102 and NR 210, Wis. Adm. Codes, became effective which replace fecal coliform limits with new *Escherichia coli* (*E. coli*) limits for protection of recreational uses. Section NR 210.06(2)(a)1, Wis. Adm. Code, includes two limits which must be included in permits for facilities which are required to disinfect:

1. The geometric mean of *E. coli* bacteria in effluent samples collected in any calendar month may not exceed 126 counts/100 mL.
2. No more than 10 percent of *E. coli* bacteria samples collected in any calendar month may exceed 410 counts/100 mL.

*E. coli* monitoring is recommended at the same frequency that fecal coliform monitoring is required in the current permit. Because Casco's permit requires weekly monitoring, the 410 counts/100 mL limit will effectively function as a daily maximum limit unless the facility performs additional monitoring. Any additional monitoring beyond what is required by the permit must also be reported on the DMR as required in the standard requirements section of the permit.

These limits are required during May through September. No changes are recommended to the current recreational period and the required disinfection season.

### **Effluent Data**

Casco has monitored effluent *E. coli* from 05/05/2020 – 09/24/2024 and a total of 110 results are available. A geometric mean of 126 counts/100 mL was not exceeded, with a maximum monthly geometric mean of 14.5 counts/100 mL. Effluent data did not exceed 410 counts/100 mL. The maximum reported value was 124 counts/100 mL. Based on this effluent data, it appears that **the facility can meet new *E. coli* limits and a compliance schedule is not needed in the reissued permit.**

## **PART 5 – PHOSPHORUS**

### **Technology-Based Effluent Limit**

Subchapter II of Chapter NR 217, Wis. Adm. Code, requires municipal wastewater treatment facilities that discharge greater than 150 pounds of Total Phosphorus per month to comply with a monthly average limit of 1.0 mg/L, or an approved alternative concentration limit. **Since Casco already has a TBEL in effect, the need for a TBEL will not be considered further.**

In addition, the need for a WQBEL for phosphorus must be considered.

### **Northeast Lakeshore Basin TMDL**

Total phosphorus (TP) effluent limits in lbs/day are calculated as recommended in the *TMDL Development and Implementation Guidance: Integrating the WPDES and Impaired Waters Programs* (April 2020) and are based on the annual phosphorus wasteload allocation (WLA) given in pounds per year. This WLA found in Appendix K of the *Total Maximum Daily Loads for Total Phosphorus and Total Suspended Solids in the Northeast Lakeshore Region* report are expressed as maximum annual loads (lbs/year).

For the reasons explained in the April 30, 2012 paper entitled *Justification for Use of Monthly, Growing Season and Annual Average Periods for Expression of WPDES Permit Limits for Phosphorus Discharges in Wisconsin*, WDNR has determined that the phosphorus WQBELs set equal to WLAs would not be consistent with the assumptions and requirements of the TMDL. Therefore, limits given to facilities included in the Northeast Lakeshore Basin TMDL are given monthly average mass limits and, if the equivalent effluent concentration is less than or equal to 0.3 mg/L, six-month average mass limits are also included. The following equation shows the calculation of equivalent effluent concentration:

$$\begin{aligned} \text{TP Equivalent Effluent Concentration} &= \text{WLA} \div (\text{365 days/yr} * \text{Flow Rate} * \text{Conversion Factor}) \\ &= 546 \text{ lbs/yr} \div (\text{365 days/yr} * \text{0.101 MGD} * \text{8.34}) \\ &= 1.8 \text{ mg/L} \end{aligned}$$

Since this value is greater than 0.3 mg/L, the WLA should be expressed as a monthly average mass limit for total phosphorus and no six-month average limit is required.

Attachment #1

$$\begin{aligned} \text{TP Monthly Average Permit Limit} &= \text{WLA} \div 365 \text{ days/yr} * \text{multiplier} \\ &= (546 \text{ lbs/yr} \div 365 \text{ days/yr}) * 1.47 \\ &= 2.2 \text{ lbs/day} \end{aligned}$$

The multiplier used in the six-month average calculation was determined according to the implementation guidance. A coefficient of variation was calculated, based on phosphorus mass monitoring data, to be 2.5. This is the standard deviation divided by the mean of mass data. However, it is believed that the optimization of the wastewater treatment system to achieve the WLA-derived permit limits will reduce effluent variability. Thus, the maximum anticipated coefficient of variation expected by the facility is 0.6. This value, along with monitoring frequency, is used to select the multiplier. The current permit specifies phosphorus monitoring as 3/weekly; if a different monitoring frequency is used, the stated limits should be reevaluated.

Monthly average mass effluent limits are recommended for this discharge. The limits are equivalent to a concentration of 2.6 mg/L at the facility design flow of 0.101 MGD.

The TMDL establishes TP wasteload allocations to reduce the loading in the entire watershed including WLAs to meet water quality standards for tributaries in the Northeast Lakeshore Basin. Therefore, WLA-based WQBELs are protective of immediate receiving waters and TP WQBELs derived according to s. NR 217.13, Wis. Adm. Code are not required.

Since wasteload allocations are expressed as annual loads (lbs/yr), permits with TMDL-derived monthly average permit limits should require the permittee to calculate and report rolling 12-month sums of total monthly loads for TP. Rolling 12-month sums can be compared directly to the annual wasteload allocation.

**Effluent Data**

The following table summarizes effluent total phosphorus monitoring data from 01/01/2020 – 01/29/2025.

**Total Phosphorus Effluent Data**

	<b>Concentration mg/L</b>	<b>Mass lbs/day</b>
1-day P <sub>99</sub>	2.51	2.34
4-day P <sub>99</sub>	1.39	1.41
30-day P <sub>99</sub>	0.63	0.59
Mean	0.32	0.24
Std	0.56	0.59
Sample size	701	701
Range	0.03 - 5.2	0.014 – 8.11

**PART 6 – TOTAL SUSPENDED SOLIDS**

Total Suspended Solids (TSS) effluent limits in lbs/day are calculated as recommended in the *TMDL Development and Implementation Guidance: Integrating the WPDES and Impaired Waters Programs* (April 2020). This WLAs found in Appendix I of the *Total Maximum Daily Loads for Total Phosphorus and Total Suspended Solids in the Northeast Lakeshore Region* report are expressed as maximum annual

loads (lbs/year).

Revisions to chs. NR 106 and 205, Wis. Adm. Code align Wisconsin water quality-based effluent limits with 40 CFR 122.45(d), which requires WPDES permits to contain the following concentration limits, whenever practicable and necessary to protect water quality:

- Weekly average and monthly average limitations for continuous discharges subject to ch. NR 210.
- Daily maximum and monthly average limitations for all other discharges.

Casco is a municipal treatment facility and is therefore subject to weekly average and monthly average TSS limits derived from TSS annual WLAs.

$$\begin{aligned} \text{TSS Monthly Average Permit Limit} &= \text{WLA} \div 365 \text{ days/yr} * \text{multiplier} \\ &= (6,547 \text{ lbs/yr} \div 365 \text{ days/yr}) * 1.47 \\ &= 26 \text{ lbs/day} \end{aligned}$$

$$\begin{aligned} \text{TSS Weekly Average Permit Limit} &= \text{WLA} \div 365 \text{ days/yr} * \text{multiplier} \\ &= (6,547 \text{ lbs/yr} \div 365 \text{ days/yr}) * 2.07 \\ &= 37 \text{ lbs/day} \end{aligned}$$

The multiplier used in the weekly average and monthly average calculation was determined according to implementation guidance. A coefficient of variation was calculated, based on TSS mass monitoring data, to be 1.9. This is the standard deviation divided by the mean of mass data. However, it is believed that the optimization of the wastewater treatment system to achieve the WLA-derived permit limits will reduce effluent variability. Thus, the maximum anticipated coefficient of variation expected by the facility is 0.6. This value, along with monitoring frequency, is used to select the multiplier. The current permit specifies TSS monitoring as 3/week; if a different monitoring frequency is used, the stated limits should be reevaluated.

Weekly average and monthly average mass effluent limits are recommended for this discharge. The limits are equivalent to concentrations of 44 mg/L and 31 mg/L, respectively, at the facility design flow of 0.101 MGD.

Since wasteload allocations are expressed as annual loads (lbs/yr), permits with TMDL-derived monthly average permit limits should require the permittee to calculate and report rolling 12-month sums of total monthly loads for TSS. Rolling 12-month sums can be compared directly to the annual wasteload allocation.

**Effluent Data**

The following table summarizes effluent total suspended solids monitoring data from 01/20/2020 – 01/29/2025.

**Total Suspended Solids Effluent Data**

	<b>Concentration mg/L</b>	<b>Mass lbs/day</b>
1-day P <sub>99</sub>	7.42	9.02
4-day P <sub>99</sub>	4.45	4.93
30-day P <sub>99</sub>	2.46	2.24

Attachment #1

	<b>Concentration mg/L</b>	<b>Mass lbs/day</b>
Mean*	1.62	1.14
Std	1.58	2.19
Sample size	796	796
Range	<1.0 - 17.6	0 – 27

\*Results below the level of detection (LOD) were included as zeroes in calculation of average.

**Casco can currently meet the TSS mass limits and a compliance schedule is not needed.**

**PART 7 – WATER QUALITY-BASED EFFLUENT LIMITATIONS  
FOR THERMAL**

Surface water quality standards for temperature took effect on October 1, 2010. These regulations are detailed in chs. NR 102 (Subchapter II – Water Quality Standards for Temperature) and NR 106 (Subchapter V – Effluent Limitations for Temperature) of the Wisconsin Administrative Code. Daily maximum and weekly average temperature criteria are available for the 12 different months of the year depending on the receiving water classification.

In accordance with s. NR 106.53(2)(b), Wis. Adm. Code, the highest daily maximum flow rate for a calendar month is used to determine the acute (daily maximum) effluent limitation. In accordance with s. NR 106.53(2)(c), Wis. Adm. Code, the highest 7-day rolling average flow rate for a calendar month is used to determine the sub-lethal (weekly average) effluent limitation. These values were based off actual flow reported from 01/01/2020 – 01/31/2025.

The table below summarizes the maximum temperatures reported during monitoring from 08/03/2020 – 11/24/2024.

**Monthly Temperature Effluent Data & Limits**

Month	Representative Highest Monthly Effluent Temperature		Calculated Effluent Limit	
	Weekly Maximum	Daily Maximum	Weekly Average Effluent Limitation	Daily Maximum Effluent Limitation
	(°F)	(°F)	(°F)	(°F)
JAN			51	79
FEB			54	86
MAR			54	75
APR			59	74
MAY			65	75
JUN			69	75
JUL			68	77
AUG	70	71	<b>66</b>	76
SEP	69	69	<b>62</b>	80
OCT	67	67	<b>55</b>	79
NOV	61	61	<b>53</b>	85

Attachment #1

Month	Representative Highest Monthly Effluent Temperature		Calculated Effluent Limit	
	Weekly Maximum	Daily Maximum	Weekly Average Effluent Limitation	Daily Maximum Effluent Limitation
	(°F)	(°F)	(°F)	(°F)
DEC			55	90

**Reasonable Potential**

Permit limits for temperature are recommended based on the procedures in s. NR 106.56, Wis. Adm. Code.

- An acute limit for temperature is recommended for each month in which the representative daily maximum effluent temperature for that month exceeds the acute WQBEL. The representative daily maximum effluent temperature is the greater of the following:
  - (a) The highest recorded representative daily maximum effluent temperature
  - (b) The projected 99th percentile of all representative daily maximum effluent temperatures
- A sub-lethal limitation for temperature is recommended for each month in which the representative weekly average effluent temperature for that month exceeds the weekly average WQBEL. The representative weekly average effluent temperature is the greater of the following:
  - (a) The highest weekly average effluent temperature for the month.
  - (b) The projected 99th percentile of all representative weekly average effluent temperatures for the month

Comparing the representative highest effluent temperature to the calculated effluent limits determines the reasonable potential of exceeding the effluent limits. The months in which limitations are recommended are shown in bold. Based on this analysis, **weekly average temperature maximum limits are necessary for the months of August, September, October, and November.**

Casco has submitted a request for consideration of dissipative cooling (DC). The previous DC study from 2019 demonstrated that the temperature returned to ambient conditions within 15-55 feet downstream of the outfall. Based on this information, the department has found that it is not necessary to include temperature limits in the reissued permit. **Temperature monitoring is recommended for one year** per the requirements of s. NR 106.59(7), Wis. Adm. Code.

**Future WPDES Permit Reissuance**

Dissipative cooling (DC) requests must be re-evaluated every permit reissuance. The permittee is responsible for submitting an updated DC request prior to permit reissuance. Such a request must either include:

- a) A statement by the permittee that there have been no substantial changes in operation of, or thermal loadings to, the treatment facility and the receiving water; or
- b) New information demonstrating DC to supplement the information used in the previous DC determination. If significant changes in operation or thermal loads have occurred, additional DC data must be submitted to the Department.

**PART 8 – WHOLE EFFLUENT TOXICITY (WET)**

WET testing is used to measure, predict, and control the discharge of toxic materials that may be harmful to aquatic life. In WET tests, organisms are exposed to a series of effluent concentrations for a given time and effects are recorded. Decisions below related to the selection of representative data and the need for WET limits were made according to ss. NR 106.08 and 106.09, Wis. Adm. Code. WET monitoring frequency and toxicity reduction evaluation (TRE) recommendations were made using the best professional judgment of staff familiar with the discharge after consideration of the guidance in the *Whole Effluent Toxicity (WET) Program Guidance Document* (2022).

- Acute tests predict the concentration that causes lethality of aquatic organisms during a 48 to 96-hour exposure. To assure that a discharge is not acutely toxic to organisms in the receiving water, WET tests must produce a statistically valid LC<sub>50</sub> (Lethal Concentration to 50% of the test organisms) greater than 100% effluent, according to s. NR 106.09(2)(b), Wis. Adm Code.
- Chronic tests predict the concentration that interferes with the growth or reproduction of test organisms during a seven-day exposure. To assure that a discharge is not chronically toxic to organisms in the receiving water, WET tests must produce a statistically valid IC<sub>25</sub> (Inhibition Concentration) greater than the instream waste concentration (IWC), according to s. NR 106.09(3)(b), Wis. Adm Code. The IWC is an estimate of the proportion of effluent to total volume of water (receiving water + effluent). The **IWC of 66%**, shown in the WET Checklist summary below, was calculated according to the following equation, as specified in s. NR 106.03(6), Wis. Adm Code:

$$\text{IWC (as \%)} = Q_e \div \{(1 - f) Q_e + Q_s\} \times 100$$

Where:

$Q_e$  = annual average flow = 0.101 MGD = 0.156 cfs

$f$  = fraction of the  $Q_e$  withdrawn from the receiving water = 0

$Q_s$  = ¼ of the 7- $Q_{10}$  = 0.32 cfs ÷ 4 = 0.08 cfs

- According to the *State of Wisconsin Aquatic Life Toxicity Testing Methods Manual* (s. NR 219.04, Table A, Wis. Adm. Code), a synthetic (standard) laboratory water may be used as the dilution water and primary control in acute WET tests, unless the use of different dilution water is approved by the Department prior to use. The primary control water must be specified in the WPDES permit.
- According to the *State of Wisconsin Aquatic Life Toxicity Testing Methods Manual* (s. NR 219.04, Table A, Wis. Adm. Code), receiving water must be used as the dilution water and primary control in chronic WET tests, unless the use of different dilution water is approved by the Department prior to use. The dilution water used in WET tests conducted on Outfall 001 shall be a grab sample collected from the receiving water location, upstream and out of the influence of the mixing zone and any other known discharge. The specific receiving water location must be specified in the WPDES permit.
- Shown below is a tabulation of all available WET data for Outfall 001. Efforts are made to ensure that decisions about WET monitoring and limits are made based on representative data, as specified in s. NR 106.08(3), Wis. Adm Code. Data which is not believed to be representative of the discharge was not included in reasonable potential calculations. The table below differentiates between tests used and not used when making WET determinations.

Attachment #1  
**WET Data History**

Date Test Initiated	Acute Results LC <sub>50</sub> %				Chronic Results IC <sub>25</sub> %					Footnotes or Comments
	<i>C. dubia</i>	Fathead minnow	Pass or Fail?	Used in RP?	<i>C. dubia</i>	Fathead Minnow	Algae (IC <sub>50</sub> )	Pass or Fail?	Use in RP?	
02/16/2006					>100	>100		Pass	Yes	
06/06/2006					>100	>100		Pass	Yes	
08/14/2008					>100	>100		Pass	No	1
07/30/2013	>100	>100	Pass	Yes	>100	>100	65.4	Pass	No	2
06/28/2016					>100	>100		Pass	Yes	
09/25/2018					>100	>100		Pass	Yes	

Footnotes:

1. *Tests done by S-F Analytical, July 2008 – March 2011.* The DNR has reason to believe that WET tests completed by SF Analytical Labs from July 2008 through March 31, 2011 were not performed using proper test methods. Therefore, WET data from this lab during this period has been disqualified and was not included in the analysis.
2. *Qualified or Inconclusive Data.* Data quality concerns were noted during the algae testing which calls into question the reliability of the test results.

- According to s. NR 106.08, Wis. Adm. Code, WET reasonable potential is determined by multiplying the highest toxicity value that has been measured in the effluent by a safety factor, to predict the likelihood (95% probability) of toxicity occurring in the effluent above the applicable WET limit. The safety factor used in the equation changes based on the number of toxicity detects in the dataset. The fewer detects present, the higher the safety factor, because there is more uncertainty surrounding the predicted value. **WET limits must be given, according to s. NR 106.08(6), Wis. Adm. Code, whenever the applicable Reasonable Potential equation results in a value greater than 1.0.**

$$\text{Acute Reasonable Potential} = [(TUa \text{ effluent}) (B)(AMZ)]$$

$$\text{Chronic Reasonable Potential} = [(TUc \text{ effluent}) (B)(IWC)]$$

According to s. NR 106.08(6)(d), Wis. Adm. Code, TUa and TUc effluent values are equal to zero whenever toxicity is not detected (i.e. when the LC<sub>50</sub>, IC<sub>25</sub> or IC<sub>50</sub> ≥ 100%).

Acute Reasonable Potential = 0 < 1.0, reasonable potential is not shown, and a limit is not required.  
Chronic Reasonable Potential = 0 < 1.0, reasonable potential is not shown, and a limit is not required.

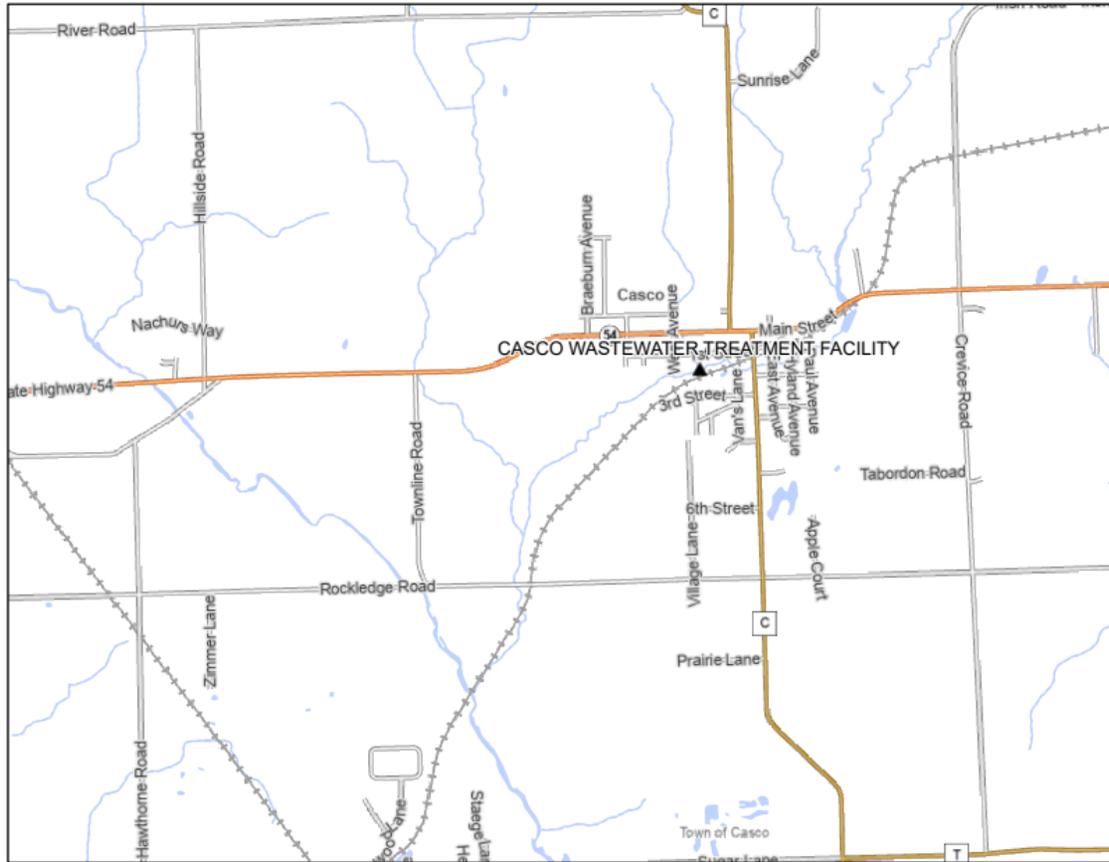
The WET checklist was developed to help DNR staff make recommendations regarding WET limits, monitoring, and other related permit conditions. The checklist indicates whether acute and chronic WET limits are needed, based on requirements specified in s. NR 106.08, Wis. Adm. Code. The checklist steps the user through a series of questions, assesses points based on the potential for effluent toxicity, and suggests monitoring frequencies based on points accumulated during the checklist analysis. As toxicity potential increases, more points accumulate, and more monitoring is recommended to ensure that toxicity is not occurring. A summary of the WET checklist analysis completed for this permittee is shown in the table below. Staff recommendations based on best professional judgment are provided below the summary table. For guidance related to reasonable potential and the WET checklist, see Chapter 1.3 of the WET Guidance Document: <https://dnr.wisconsin.gov/topic/Wastewater/WET.html>.

Attachment #1  
**WET Checklist Summary**

	<b>Acute</b>	<b>Chronic</b>
<b>AMZ/IWC</b>	Not Applicable. <b>0 Points</b>	IWC = 66%. <b>15 Points</b>
<b>Historical Data</b>	1 test used to calculate RP – over 5 years old. No tests failed. <b>5 Points</b>	5 tests used to calculate RP – over 5 years old. No tests failed. <b>5 Points</b>
<b>Effluent Variability</b>	Little variability, no violations or upsets, consistent WWTF operations. <b>0 Points</b>	Same as Acute. <b>0 Points</b>
<b>Receiving Water Classification</b>	Coldwater community <b>5 Points</b>	Same as Acute. <b>5 Points</b>
<b>Chemical-Specific Data</b>	No reasonable potential for limits based on ATC; Ammonia nitrogen limit carried over from the current permit. Copper, nickel, zinc, chloride, and ammonia detected. Additional Compounds of Concern: None. <b>3 Points</b>	No reasonable potential for limits based on CTC; Ammonia nitrogen limit carried over from the current permit. Copper, nickel, zinc, chloride, and ammonia detected. Additional Compounds of Concern: None. <b>3 Points</b>
<b>Additives</b>	1 Water Quality Conditioner (ferric chloride) added. Permittee has proper P chemical SOPs in place. <b>1 Point</b>	All additives used more than once per 4 days. <b>1 Point</b>
<b>Discharge Category</b>	0 Industrial Contributors. <b>0 Points</b>	Same as Acute. <b>0 Points</b>
<b>Wastewater Treatment</b>	Secondary or Better <b>0 Points</b>	Same as Acute. <b>0 Points</b>
<b>Downstream Impacts</b>	No impacts known <b>0 Points</b>	Same as Acute. <b>0 Points</b>
<b>Total Checklist Points:</b>	<b>14 Points</b>	<b>29 Points</b>
<b>Recommended Monitoring Frequency (from Checklist):</b>	No tests needed	3x/permit term
<b>Limit Required?</b>	No	No
<b>TRE Recommended? (from Checklist)</b>	No	No

- After consideration of the guidance provided in the Department's *WET Program Guidance Document* (2022) and other information described above, 3x/permit term chronic WET tests are recommended in the reissued permit. Sampling WET concurrently with any chemical-specific toxic substances is recommended. Tests should be done in rotating quarters, to collect seasonal information about this discharge.

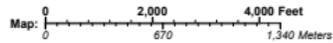
# Casco WWTF Discharge Location



**Legend:** (some map layers may not be displayed)

- ▲ Surface Water Outfalls
- Rivers and Streams
- - - Intermittent Streams
- Open Water
- Latest Leaf Off Imagery**
- Red: Band\_1
- Green: Band\_2
- Blue: Band\_3

**Notes:**  
Not to scale



Service Layer Credits:  
Latest Leaf Off Imagery: Basic Basemap (Cached); WPDES Outfall Variances: WDNR, Water Division, Lynn Singletary

Map projection: NAD 1983 HARN Wisconsin TM

This map is a product generated by a DNR web mapping application.

This map is for informational purposes only and may not have been prepared for or be suitable for legal, engineering, or surveying purposes. The user is solely responsible for verifying the accuracy of information before using for any purpose. By using this product for any purpose user agrees to be bound by all disclaimers found here: <https://dnr.wisconsin.gov/legal>

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Attachment #3  
**2011 Ammonia Calculations**

Daily maximum limitations are based on acute toxicity criteria, which are a function of the effluent pH and the receiving water classification. The acute toxicity criterion (ATC) for ammonia is calculated using the following equation.

$$\text{ATC in mg/L} = [A \div (1 + 10^{(7.204 - \text{pH})})] + [B \div (1 + 10^{(\text{pH} - 7.204)})]$$

Where:

A = 0.275 and B = 39.0 for a Coldwater Category 1 fishery, and  
 pH (su) = that characteristic of the effluent.

The effluent pH reported from January 1, 2008 through February 28, 2011 was examined as part of this evaluation. Of 825 data points, the maximum pH of 7.7 (standard units or su) was reported once, while 7.6 was reported 22 times. So 99% of the time the pH was 7.6 or less. (Note that the 1-day P<sub>99</sub> pH value computed in accordance with s. NR 106.05(5) is 7.76 su, while the mean plus three times the standard deviation equals 7.90 su.) The value of 7.9 is believed appropriate to use to determine an effluent limitation for ammonia-nitrogen based on acute toxicity. Substituting 7.9 into the equation above for pH, yields ATC = 6.77 mg/L, and a calculated daily maximum effluent limitation of 14 mg/L, after rounding to two significant figures. Because of the more stringent limitation of the previous permit term, a continuation of the 9.3 mg/L limit is recommended year round. The higher limit would be allowed if the facility is able to demonstrate need under s. NR 207.04 (a).

Effluent pH - s.u.	NH <sub>3</sub> -N Limit - mg/L	Effluent pH - s.u.	NH <sub>3</sub> -N Limit - mg/L
pH ≤ 7.1	No Limit	8.0 < pH ≤ 8.1	9.3
7.1 < pH ≤ 7.2	39*	8.1 < pH ≤ 8.2	7.6
7.2 < pH ≤ 7.3	35*	8.2 < pH ≤ 8.3	6.3
7.3 < pH ≤ 7.4	31*	8.3 < pH ≤ 8.4	5.2
7.4 < pH ≤ 7.5	27*	8.4 < pH ≤ 8.5	4.3
7.5 < pH ≤ 7.6	23*	8.5 < pH ≤ 8.6	3.5
7.6 < pH ≤ 7.7	19	8.6 < pH ≤ 8.7	3.0
7.7 < pH ≤ 7.8	16	8.7 < pH ≤ 8.8	2.5
7.8 < pH ≤ 7.9	14	8.8 < pH ≤ 8.9	2.1
7.9 < pH ≤ 8.0	11	8.9 < pH ≤ 9.0	1.8

\* During the months of May through October if the pH is less than or equal to 7.6 there is no daily maximum limit for NH<sub>3</sub>-N. Limits shown in the table above with an asterisk\* apply from November through April only.

$$\text{CTC} = E \times \{ [0.0676 \div (1 + 10^{(7.688 - \text{pH})})] + [2.912 \div (1 + 10^{(\text{pH} - 7.688)})] \} \times C$$

Where:

pH = the pH (s.u.) of the receiving water,

E = 0.854,

C = the minimum of 2.85 or  $1.45 \times 10^{(0.028 \times (25 - T))}$ ,

T = the temperature (°C) of the receiving water

Attachment #3

The 4-Day criterion is simply equal to the 30-Day criterion multiplied by 2.5. The 4-day criteria are used in a mass-balance equation with the 7-Q<sub>10</sub> (4-Q<sub>3</sub>, if available) to derive weekly average limitations. And the 30-day criteria are used with the 30-Q<sub>5</sub> (estimated as 85% of the 7-Q<sub>2</sub> if the 30-Q<sub>5</sub> is not available) to derive monthly average limitations. The stream flow value is further adjusted to temperature. If the Temp. ≥ 16 °C 100% of the flow is used. If the Temp. < 11 °C only 25% of the flow is used. If the Temp. ≥ 11 °C but < 16 °C, 50% of the flow is used. Background data for the Casco Creek is lacking so the effluent limitations based on chronic toxicity are calculated utilizing “default” assumed values for Temperature, pH and background ammonia concentrations. Tabulated below are limitations are based upon the annual average effluent design flow of 0.101 MGD and the background conditions as shown.

	<b>SUMMER</b>	<b>WINTER</b>	<b>SPRING</b>
	June – October	November - March	April & May
<b>BACKGROUND INFORMATION:</b>			
7-Q <sub>10</sub> (cfs)	0.32	0.32	0.32
7-Q <sub>2</sub> (cfs)	0.68	0.68	0.68
Ammonia (mg/L)	0.05	0.16	0.04
Temperature (degrees C)	20	<7	10
pH (standard units)	8.21	7.97	7.97
% of river flow used:	100	25	25
Reference weekly flow:	0.32	0.08	0.08
Reference monthly flow:	0.578	0.1445	0.1445
<b>CRITERIA (in mg/L):</b>			
4-day Chronic (@ background pH)	3.10	6.35	4.41
30-day Chronic (@ background pH)	1.24	2.54	1.76
<b>EFFLUENT LIMITS (in mg/L):</b>			
<b>Weekly average</b>	9.3	9.5	6.6
<b>Monthly average</b>	5.6	4.7	3.4